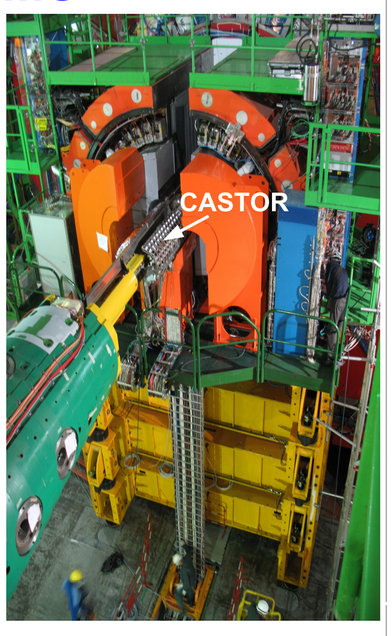
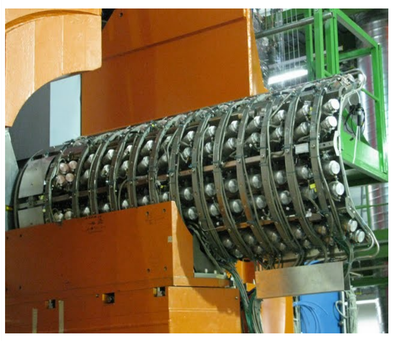
Operational Experience with the CMS CASTOR Calorimeter at the LHC

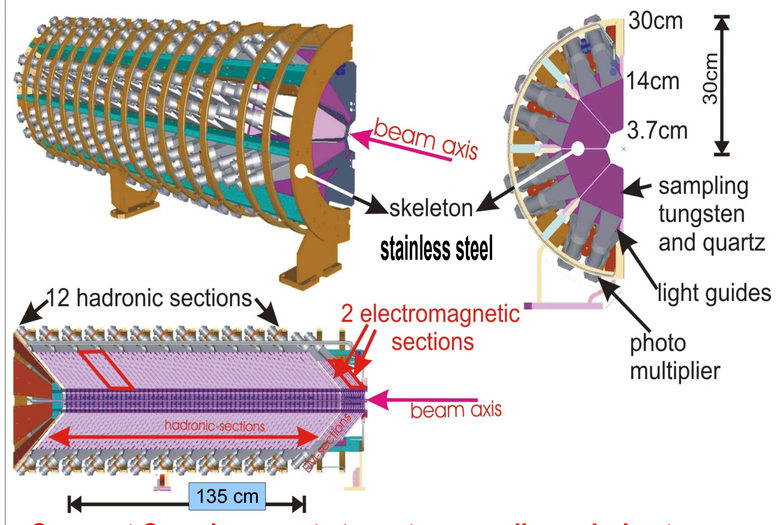
Apostolos D. Panagiotou (Athens), for the CMS-CASTOR group
https://twiki.cern.ch/twiki/bin/view/CMS/CASTOR

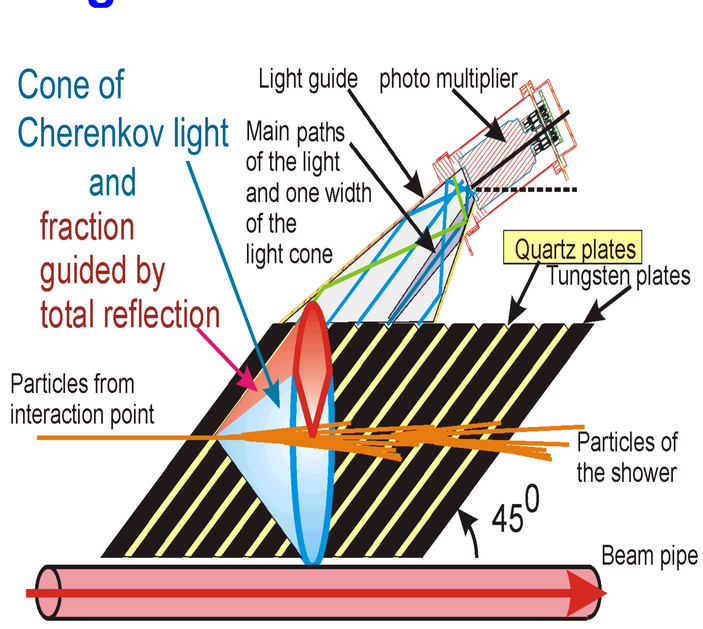
Installation in CMS





Detector Design





- **Compact Cerenkov quartz-tungsten sampling calorimeter**
- **Located at 14.5m from IP5 and covering [- 6.6 < η < - 5.2]**
- **2EM + 12HD longitudinal sections and 16 azimuthal sectors**
- **224 readout channels in total**
- **Total depth ~ 10 λ_I**

> Magnetic field in CASTOR region is measured up to 0.16 T
> Fine-mesh photomultipliers tolerate magnetic filed ≤ 0.5 T

Energy Calibration

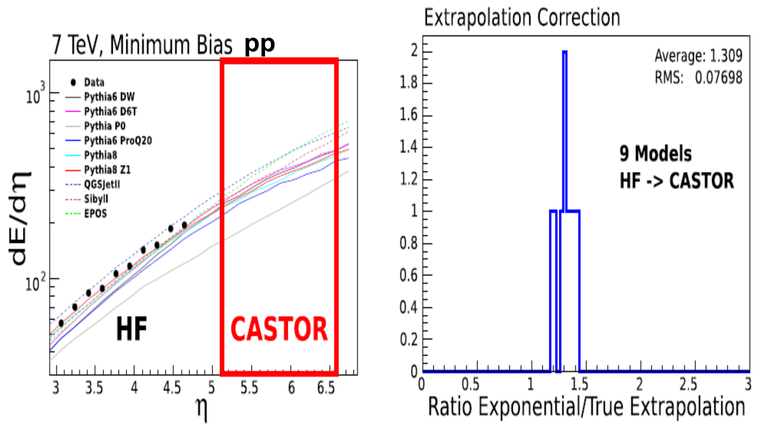
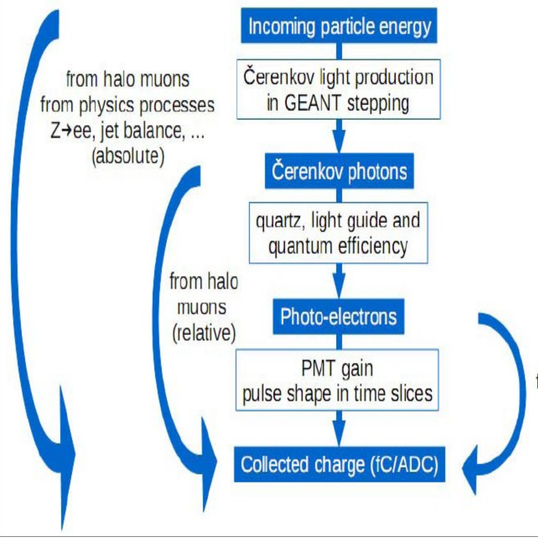
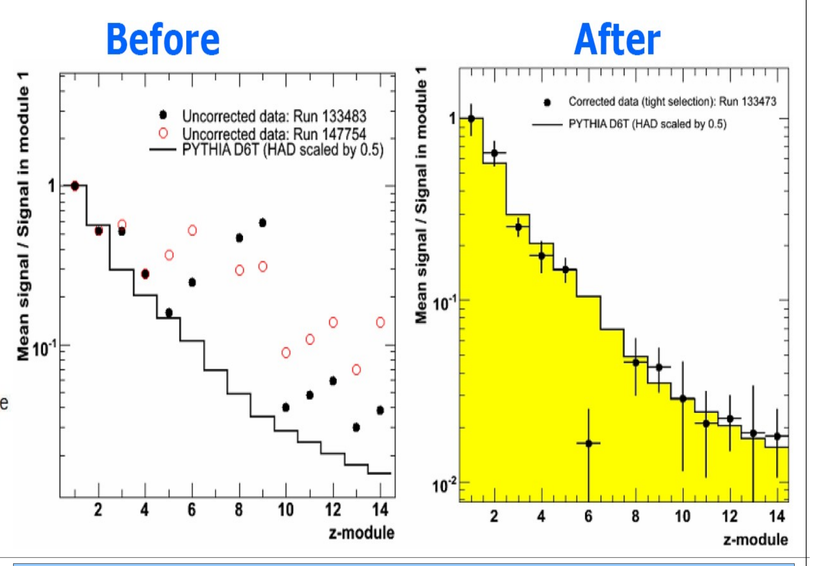


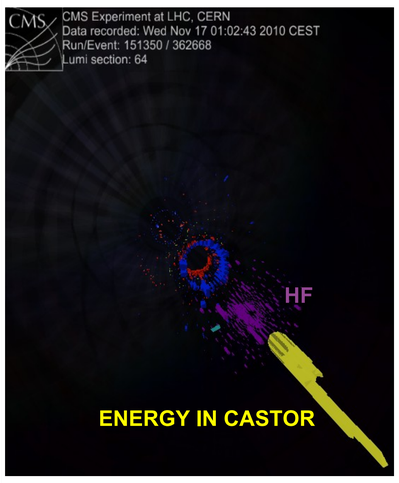
Figure 5: Left panel: Pseudorapidity dependence of energy flow measured in HF and corrected to the hadron level together with MC simulations which are extended to the CASTOR η range. Right panel: Distribution of offsets for extrapolation of energy to CASTOR.

In situ Channel inter-Calibration with muons



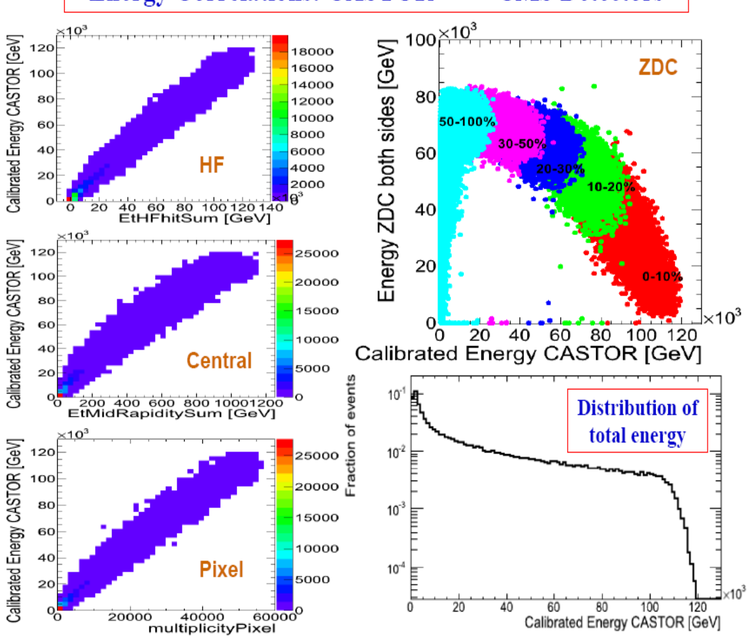


Physics with CASTOR - PbPb



Ongoing analysis:
- Energy Flow
- Eliptic Flow
- 'Exotica'
- UPC

Energy Correlations: CASTOR ↔ CMS Detectors



Physics with CASTOR - pp

Ongoing analysis:
- multi-parton and underlying event tuning
- proton structure at small-x
- diffraction with rapidity gaps

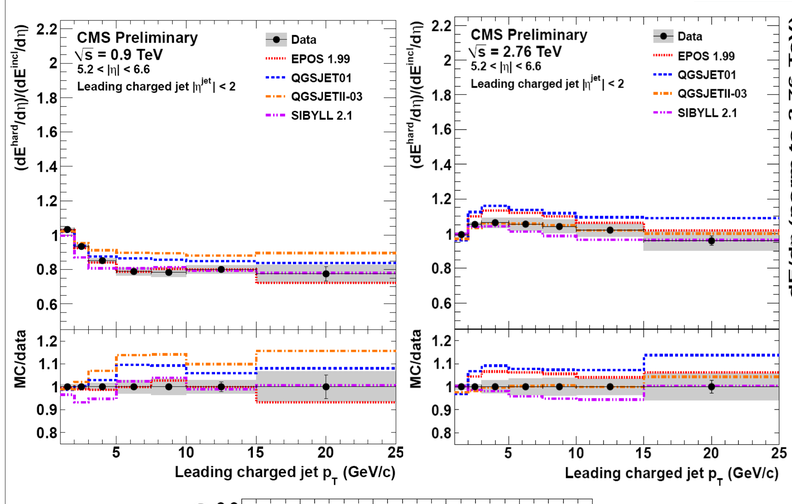


Figure 5: Ratio of the energy deposited in the pseudorapidity range $5.2 < |\eta| < 6.6$ for events with a charged particle jet with $|\eta^{\text{jet}}| < 2$ with respect to the energy in inclusive events, as a function of charged particle jet transverse momentum p_T for $\sqrt{s} = 0.9$ (left), 2.76 (right) and 7 TeV (bottom). Corrected results are compared to MC models used in cosmic ray physics. Error bars indicate the statistical error on the data points, while the grey band around data points represents the statistical and systematic uncertainties added in quadrature.

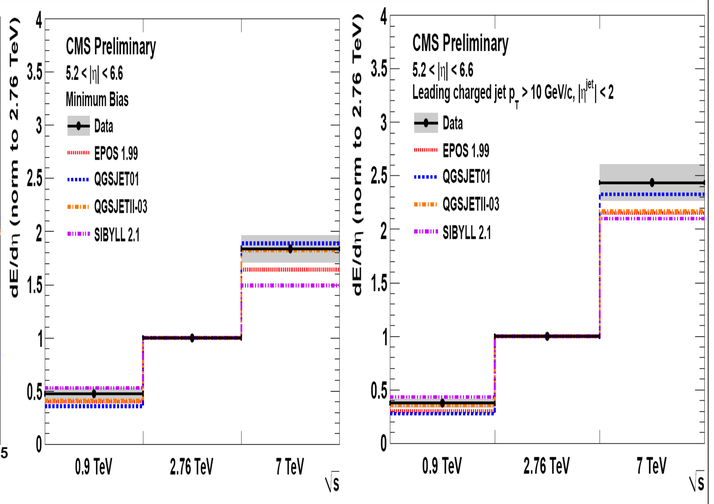


Figure 7: Energy density in the pseudorapidity range $5.2 < |\eta| < 6.6$ in minimum-bias events (left) and in events with a charged particle jet in the range $|\eta^{\text{jet}}| < 2$ (right) as a function of $\sqrt{s}$, normalized to the energy density at $\sqrt{s} = 2.76$ TeV. The p_T threshold used for charged particle jets is 10 GeV/c at all centre-of-mass energies. Corrected results are compared to MC models used in cosmic ray physics. Statistical errors are smaller than the markers size, while the grey band around data points represents the statistical and systematic uncertainties added in quadrature.

CMS PAS FWD-11-003